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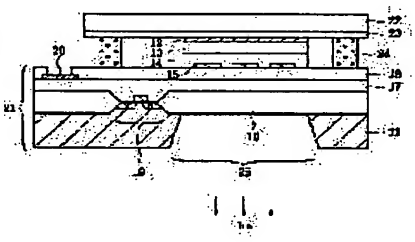
(54) DISPLAY DEVICE AND ITS MANUFACTURE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an EL display device integrated with many fine picture elements (dots) at a low cost.

SOLUTION: This display device is laminated with EL elements 12-15 on a silicon substrate 11, a nearly transparent membrane 16 is exposed on the back face side of the silicon substrate 11, and the luminescent light from the EL elements 12-15 is emitted from the back face side of the silicon substrate 11.



LEGAL STATUS

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CLAIMS

[Claim(s)]
[Claim 1] the display with which the laminating of the EL element was carried out on the silicon substrate -- it is -- the rear-face side of said silicon substrate -- at least -- a display -- setting -- a profile -- the display characterized by the transparent membrane being exposed and the luminescence light from said EL element carrying out outgoing radiation from the rear-face side of said silicon substrate.
[Claim 2] An EL element is a display according to claim 1 characterized by being arranged in the shape of a two-dimensional matrix.
[Claim 3] A matrix is a display according to claim 2 characterized by forming a active matrix.
[Claim 4] It is the display according to claim 3 characterized by for the active matrix consisting of a level signal line and a vertical-scanning line, connecting said both wiring with the transistor for access, connecting the remaining main electrode of said transistor with the control electrode of the transistor for actuation with which others differ from retention volume, and driving said EL element with said transistor for actuation.
[Claim 5] The display according to claim 1 to 4 characterized by having a light filter in the silicon substrate rear-face side of a display.
[Claim 6] The display according to claim 5 characterized by having a fluorescent substance layer between a silicon substrate and a light filter.
[Claim 7] The display according to claim 1 to 6 characterized by having the substrate for wiring drawers by which electrical installation is carried out to the cathode of an EL element.
[Claim 8] Electrical installation is a display according to claim 7 characterized by being carried out with the electric conduction binder which does not contain a big foxtail millet.
[Claim 9] Electrical installation is a display according to claim 7 characterized by being carried out with a conductive liquid or liquid crystal.
[Claim 10] The display according to claim 7 characterized by having the contact which performs electrical installation of the substrate for wiring drawers, and said silicon substrate.
[Claim 11] a silicon substrate -- the inside of said substrate -- a profile -- the display according to claim 1 to 10 characterized by being the SOI (silicon on insulator) substrate which has a transparent insulator layer.
[Claim 12] The display according to claim 11 characterized by forming the single crystal transistor for driving said EL element in the display on a SOI substrate.
[Claim 13] The display according to claim 1 to 12 with which an EL element is characterized by carrying out the laminating in the order of an anode plate, EL layer, and cathode on a silicon substrate.
[Claim 14] The display according to claim 13 with which EL layer is characterized by being an organic compound layer (one layer or two or more layers).
[Claim 15] the inside of a silicon substrate, or a silicon substrate top -- a profile -- the manufacture approach of the display characterized by to have at least the process at which said membrane is exposed by anisotropic etching from the rear-face side of said silicon substrate of the process which forms a transparent membrane, the process which forms the anode plate of an EL element on said

silicon substrate, forms the luminous layer of said EL element on said anode plate, and forms cathode on said luminous layer, and the display in which said EL element is formed.
[Claim 16] The manufacture approach of the display according to claim 15 characterized by performing alignment of the light filter arranged to the substrate rear-face side of said display using the luminescence light from an EL element.
[Claim 17] The manufacture approach of the display according to claim 15 or 16 characterized by forming simultaneously the contact which carries out electrical installation of said cathode and the substrate for wiring drawers after forming cathode, and carries out electrical installation of said both substrates for said substrate for wiring drawers and said silicon substrate in the ****** case.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to a display and its manufacture approach, the display that carried out the rarefaction of some opaque substrates especially, and its manufacture approach.
[0002]
[Description of the Prior Art] In the display using the former and an EL element, it is Synthetic. Metals Usually like 91(1977) 3-7"Organic multi-color electroluminescence display with finepixels" (reference 1), sequential formation of an anode plate, each class which is an EL layer, and the cathode is carried out on a glass substrate. It has a work function which is easy to pour an electron hole (hole) into an anode plate, for example, good conductors, such as ITO (indium TIN oxide), are chosen. Moreover, for example, aluminum alloy which has a work function which is easy to pour an electron into cathode similarly is chosen.
[0003] Moreover, in the substrate which forms EL layer, it is SiD98 in addition to a glass substrate. DiGEST It is also well-known to use the SOI substrate formed using the substrate transfer technique like pp949 "100-MHz Active-Matrix Electroluminescent Displays" (reference 2).
[0004] Moreover, in order to make the dot pitch of EL layer small in recent years, in reference 1, tooth-space 30micrometer cathode spacing is realized using the lift-off method of a photoresist, and dot (pixel) pitch 12micrometer is realized by reference 2 using the ultra-fine processing technology of Si semi-conductor.
[0005] Moreover, the member which changes from silicon to the Lord of the display of an opaque silicon substrate is removed using anisotropic etching, and there are JP,5-21338,A and JP,6-67205,A in the example which carried out the rarefaction.
[0006]

[Problem(s) to be Solved by the Invention] However, as shown below, there are four big troubles in a Prior art.

[0007] (1) In the display which used [1st] organic electroluminescence, it is the point that formation of the ITO electrode which is an anode plate is difficult on EL.

[0008] If it is going to obtain a dot pitch detailed as mentioned above, the best approach will use a well-known semi-conductor processing technique, but as shown in drawing 11 , as long as the opaque single crystal Si substrate 201 is used, the anode plate 205 which forms light in the substrate upper part from it being necessary to carry out outgoing radiation up inevitably will turn into a transparent ITO electrode.

[0009] However, since the temperature of about 200 degrees C is required, a thermal-resistance top is difficult for formation of the ITO electrode to organic electroluminescence to formation of an ITO electrode, so that it may mention above.

[0010] (2) Generally the 2nd is the point that driver voltage is high (>100V), in inorganic [in which easy thermal resistance has formation of an ITO electrode / EL]. In the above-mentioned reference 2, this problem is solved by using the good SOI substrate of component separability.

[0011] If the electrical potential difference generally used becomes high, the dimension of a component and the dimension of a field required for isolation will become large, therefore implementation of a detailed pixel or a dot pitch will be made impossible. The effective channel length of CMOS which is a driver element in reference 2 is also 1.2 micrometers, and it is a several times bigger value compared with the dimension in which current processing is possible.

[0012] A big component or a pixel makes cutback-ization of a display difficult. Big substrate size and a chip size can be taken, and bring about lowering of the yield by reduction of a number, and buildup of a defect, therefore cause the cost rise of a display.

[0013] In the indicating equipment of a direct viewing type, it is required at least 600dpi (dot par inch), i.e., about dot pitch 42micrometer. Moreover, in displays accompanied by amplification optical system, such as HMD (head-mounted display) and a projector, it may be able to manufacture more cheaply [as the magnitude of the substrate carrying EL is small].

[0014] In the above thing to this time, the organic electroluminescence in which low-battery actuation is possible is more desirable than inorganic [EL].

[0015] (3) Although the 1st problem is clearable by using the transparence substrate 211 as shown [3rd] in drawing 12 , a transparence substrate is having the fault of the flume shoes in comparison with a single crystal Si substrate.

[0016] When the transparence substrate 211 is a glass substrate first, the semi-conductor film formed on a substrate is amorphous one or polish recon film, therefore the carrier mobility in the film will become lower than the inside of single crystal silicon. Moreover, the component which the electrical property of other leakage current also tends to worsen, therefore is formed on a substrate, and a circuit will become a powerless object. However, the pixel transistor which a current indicating equipment is running with vigor with the rapid formation of many pixels, therefore does not have actuation capacity, and the circumference actuation circuit have reduced the value sharply.

[0017] Moreover, when the transparence substrate 211 is a SOI substrate, although the component and circuit which the semi-conductor film formed on a substrate is single-crystal-silicon film, therefore were formed on the substrate have the engine performance more than a single crystal Si substrate and an EQC, the price of a SOI substrate is expensive [a circuit] also for whether it being a flume in comparison with a single crystal Si substrate.

[0018] Two substrates of the special substrate with which the original electrical circuit was formed, and the transparent substrate to stick are needed for manufacture of the SOI substrate formed of the above-mentioned substrate transfer, and it is anti-ecology-like. Moreover, the SOS substrate which is a typical SOI substrate is several times the price of the usual single crystal Si substrate, and acquisition is difficult.

[0019] (4) Since the transparent insulating thin film (membranes 235-238) which remains [4th] by

anisotropic etching in LCD which carried out the rarefaction of the substrate by silicon anisotropic etching as shown in drawing 13 was not able to hold the uniform gap of LCD without existence of moderate tensile stress or reinforcing materials so that it may be well-known, it had caused buildup of the yield or a manufacturing cost.

[0020] To guarantee a uniform gap with tensile stress, the big tensile stress near membranous disruptive strength is required for a membrane. When stress became high and it was anisotropic etching, the phenomenon in which the film broke in liquid was produced, and the yield was reduced.

[0021] Moreover, when preparing reinforcing materials, a large change and variation have arisen from the difference in coefficient of thermal expansion with the member used for liquid crystal, reinforcing materials, and a liquid crystal cell in the temperature characteristic of the gap of LCD. This is like [which makes the engine performance of LCD fall remarkably and makes it unusable as a matter of fact].

[0022]

[Means for Solving the Problem] This invention removes the above-mentioned fault and aims at offering cheaply EL display which accumulated many detailed pixels (dot).

[0023] namely, the display with which, as for this invention, the laminating of the EL element was carried out on the silicon substrate -- it is -- the rear-face side of said silicon substrate -- at least -- a display -- setting -- a profile -- it is the display characterized by the transparent membrane being exposed and the luminescence light from said EL element carrying out outgoing radiation from the rear-face side of said silicon substrate.

[0024] moreover, this invention -- the inside of a silicon substrate, or a silicon substrate top -- a profile -- it is the manufacture approach of the display characterized by to have at least the process at which said membrane exposes by anisotropic etching from the rear-face side of said silicon substrate of the process which forms a transparent membrane, the process which forms the anode plate of an EL element on said silicon substrate, forms the luminous layer of said EL element on said anode plate, and forms cathode on said luminous layer, and the display in which said EL element is formed.

[0025] The substrate which accumulates a detailed pixel is a single crystal Si substrate, and the circumference circuit which has much pixels and high actuation capacity is realized by the above-mentioned cheap single crystal Si substrate. The membrane which makes the film transparent at least a subject is formed in a part for the pixel display of a single crystal Si substrate of the addition process which does not very cause a cost rise. On the membrane, the ITO electrode which is a transparent anode plate is formed, and EL layer and cathode are formed on it. Since EL layer is formed above an ITO electrode at a next process according to this invention, the above-mentioned heat-resistant problem is not produced.

[0026] the anisotropy [silicon chip / the pixel part which consists of an ITO electrode - cathode, the substrate in which the well-known circumference circuit for driving a pixel was carried, or] Si etching-using alkali water solution well-known at next process etc. method -- a part for a pixel display -- the profile from the rear face of a substrate -- the base which changes from Si to the Lord by the side of a rear face until a transparent membrane is exposed -- etching clearance of the member is carried out. Thereby, at least, the rarefaction of the part for a pixel display is carried out, the light guide of luminescence from EL layer becomes possible outside, and the function as a display is obtained.

[0027] Moreover, since the display of this invention is not LCD, it is not necessary to realize a uniform liquid crystal cell gap. It is unnecessary at all in the tensile stress for realizing the above-mentioned uniform cel gap, therefore the stress of a membrane can be set up free. Therefore, large freedom arises in the member used for a membrane. For example, many various CVD film into a semi-conductor process ingredient which has compressive stress is also employable. Moreover, the film crack of the above etching processes is not produced, either.

[0028] Since anisotropic etching is fixed and carried out to the substrate for wiring drawers which counters, for example, the membrane of this invention is sharply mitigated about the film crack.

Moreover, it is not necessary to consider the gap ununiformity by difference of coefficient of thermal expansion. In this invention, although internal stress occurs somewhat according to the difference of the coefficient of thermal expansion of a membrane and the member which fixes, stress is not magnitude to the extent that a crack and separation are produced.

[0029]

[Embodiment of the Invention] (1st operation gestalt) The outline sectional view of the passive-matrix mold display which is the 1st operation gestalt of this invention is shown in drawing 1 .

[0030] 11 is a CZP (100) silicon substrate with a thickness of 625 micrometers, and 16 is a LOCOS oxide film with a thickness of 1 micrometer formed on it. The circumference circuit 19 which consists of N-channel MOS FET for driving a pixel is formed in the periphery of a silicon substrate 11.

[0031] 17 is an interlayer insulation film which consists of CVDSiO2 with a thickness of 1 micrometer, and the bonding pad 20 for electrical installation with the exterior is formed on it. 18 is passivation film which consists of plasma SiN with a thickness of 1 micrometer.

[0032] A total of 1000 anode plates 15 which consist of an ITO electrode for moreover making an EL element emit light is formed in the display 25 at intervals of [of 10 micrometers] a width of 10 micrometers. The anode plate 15 is connected to the circumference circuit 19 by the below-mentioned approach with wiring which is not illustrated. After being manufactured from a silicon substrate 11 in a semi-conductor process well-known up to an anode plate 15, a dining room is carried out, and it becomes the silicon chip 21 of a magnitude the angle of 25mm.

[0033] The laminating of the aromatic series tertiary amine which is the electron hole transporting bed 14 with a thickness of 500A is carried out by the vacuum deposition method on the display 25 of a silicon chip 21 after that. Subsequently, the laminating of the organometallic complex which is the electronic transporting bed 13 with a thickness of 500A is carried out by the law. aluminum alloy electrode with a thickness of 1500A which is finally cathode 12 is formed in the location on which it decided beforehand at the include angle which similarly intersects perpendicularly with an anode plate 15 at intervals of [of 10 micrometers] a width of 10 micrometers a total of 1000.

[0034] The substrate 22 for drawers with which the drawer electrode 23 which has the same circuit pattern was formed on cathode 12 has pasted up in the precision of **1 micrometer together with the silicon chip 21 using the sealant 24. The sealant 24 serves also as work of a sealing agent, and has prevented encroachment of the dirt from the external world, or moisture.

[0035] The field of a magnitude the angle of 10 micrometers where an anode plate 15 and cathode 12 cross is equivalent to a single EL element. That is, the passive matrix of an EL element is formed of an anode plate 15, the electron hole transporting bed 14 which is an EL layer and the electronic transporting bed 13, and cathode 12.

[0036] EL indicating equipment is contained by the etching fixture suitable after the substrate 22 for drawers is connected, and clearance of the silicon substrate 11 by the side of the rear face of a display 25 is performed by the well-known anisotropic etching technique.

[0037] It is performed for etching by for example, the TMAH (tetramethylammonium hydroxide) water solution 22%. The rarefaction only of the display 25 is carried out by performing alternative etching using the etching mask formed in the rear face of a fixture or a silicon substrate 11 in etching. Etching will stop automatically, if the LOCOS oxide film 16 which mainly consists of the thermal oxidation film is exposed. consequently, the configuration of the silicon chip 21 of a display 25 -- a profile -- it becomes only the transparent LOCOS film 16, an interlayer insulation film 17, the passivation film 18, and about 3-micrometer membrane of an anode plate 15.

[0038] In a forward electrical potential difference, an EL element emits light to an anode plate 15 in cathode 12 by carrying out the seal of approval of the negative electrical potential difference. luminescence -- a profile -- a transparent membrane is penetrated and it is led out of EL display.

[0039] The representative circuit schematic of this operation gestalt is shown in drawing 2 .

[0040] The number of pixels (dot) is 1000x1000 as mentioned above, and it is connected so that a

passive matrix may be formed between the vertical line 102 to which 1 million EL elements 101 change from an anode plate 15, and the horizontal line 103 which consists of cathode 12.

[0041] Actuation of a matrix is driven with the level shift register (HSR) 105 which is the external circuit which is not illustrated to drawing 1 R> 1 linked to the horizontal line 103 pulled out with the drawer electrode 23 from the vertical shift register (VSR) 104 which is the circumference circuit 19, and cathode 12. The signal for actuation and supply voltage which were created based on the video signal 107 from the digital disposal circuit 106 which is an external circuit as well as both the registers 104,105 are supplied. The digital disposal circuit 106 to VSR104 and connection with a power source are made via a bonding pad 20.

[0042] According to this operation gestalt, since the field where two electrodes 12 and 15 cross is the unit dimension (size) of electrode wiring, it can create a very detailed pixel.

[0043] In addition, although especially the EL element used for this invention is not limited but both an organic EL device and an inorganic EL element can be used, the EL element constituted at least by an anode plate layer and catholyte, and the organic compound layer (one layer or two or more layers) pinched among these is used suitably.

[0044] What has a big work function as an ingredient of an anode plate 15 is desirable, for example, can use ITO, tin oxide, gold, platinum, palladium, a selenium, iridium, copper iodide, etc. On the other hand, what has a work function small as an ingredient of cathode 12 is desirable, for example, can use Mg/Ag, Mg, aluminum and In(s), or these alloys.

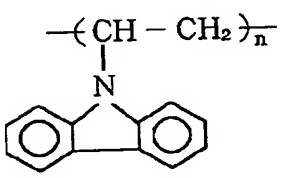
[0045] As an organic compound layer may be a configuration much more, and may be two or more layer configuration, for example, is shown in drawing 1 , it consists of an electron hole transporting bed 14 into which an electron hole is poured from an anode plate 15, and an electronic transporting bed 13 into which an electron is poured from catholyte 12, and the electron hole transporting bed 14 or the electronic transporting bed 13 turns into a luminous layer. Moreover, the fluorescent substance layer containing a fluorescent substance may be prepared between an electron hole transporting bed and an electronic transporting bed. Moreover, the configuration which served both as the electron hole transporting bed, the electronic transporting bed, and the fluorescence layer by mixed 1 lamination is also possible.

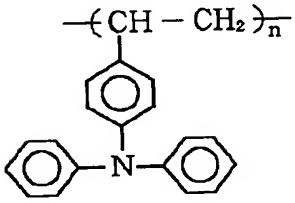
[0046] As an electron hole transporting bed 14, they are N, N'-screw (3-methylphenyl)-N, and N'-diphenyl, for example. - (1 and 1'-biphenyl) -4 and 4'-diamine (henceforth, TPD) can be used, in addition the following organic material can be used.

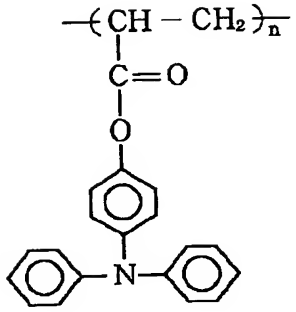
[0047]
[Formula 1]

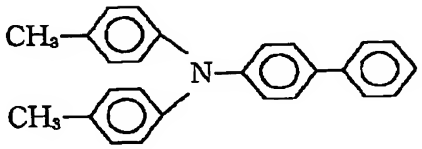
ホール輸送性化合物

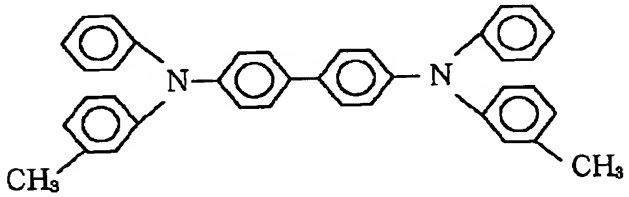
ホール輸送体

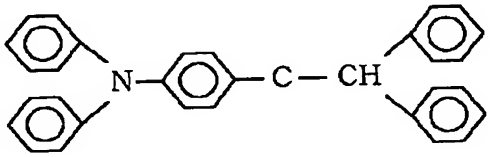






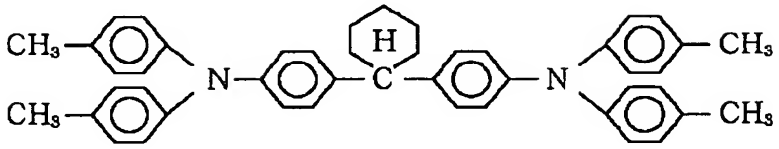


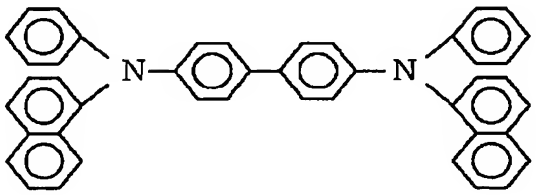


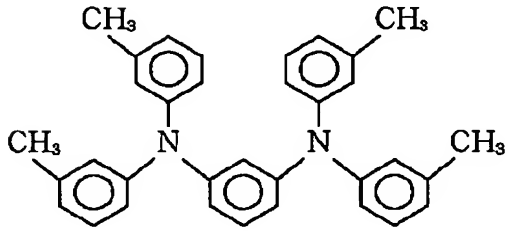


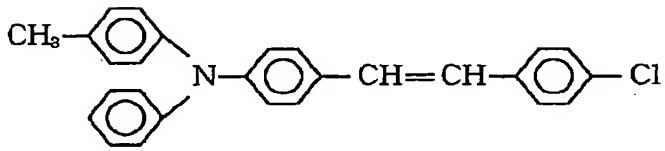
[0048]
[Formula 2]

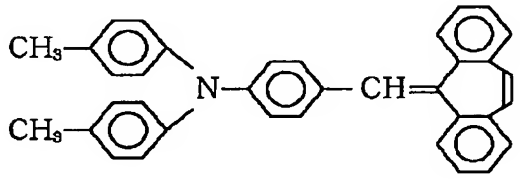
ホール輸送性化合物





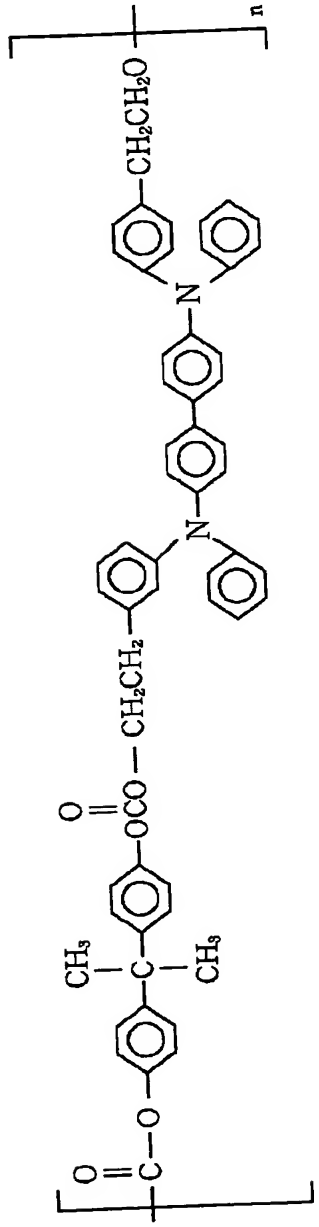






[0049]
[Formula 3]

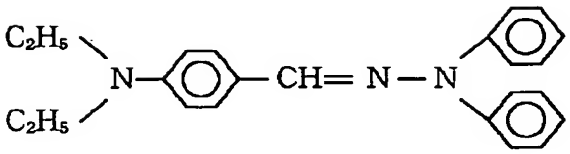
ホール輸送性化合物

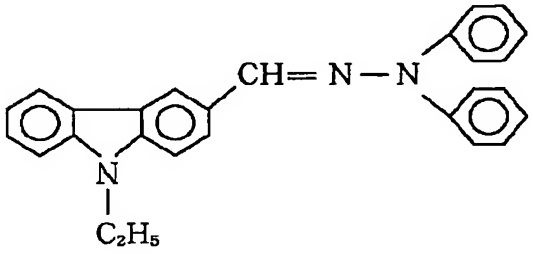


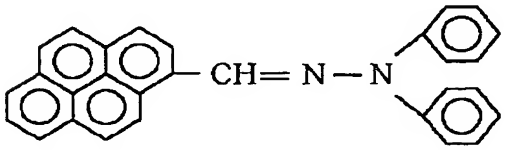
[0050]

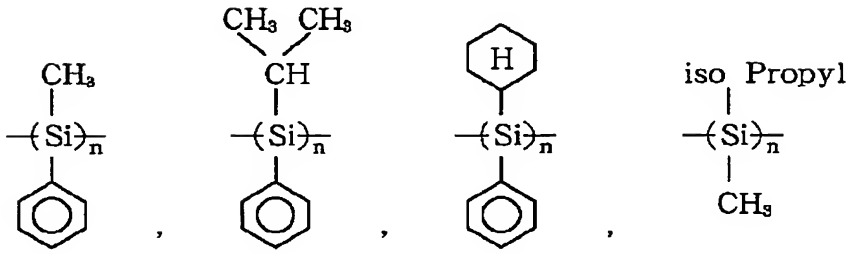
[Formula 4]

ホール輸送性化合物



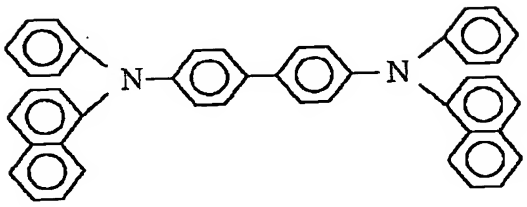


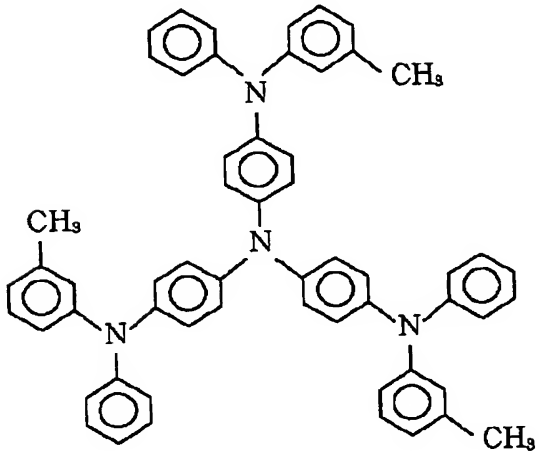




[0051]
[Formula 5]

ホール輸送性化合物

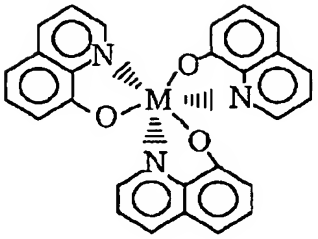




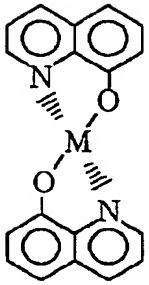
[0052] Moreover, inorganic materials, such as a-Si and a-SiC, may be used, for example.
[0053] As an electronic transporting bed 13, tris (eight quinolinol) aluminum (henceforth, Alq3) can be used, in addition the following ingredient can be used, for example.

[0054]
[Formula 6]

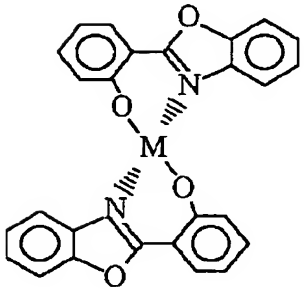
電子輸送性化合物



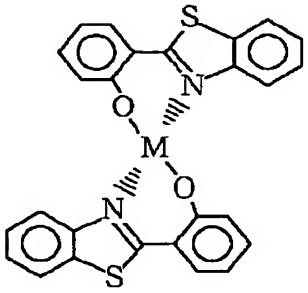
M : Al, Ga



M : Zn, Mg, Be



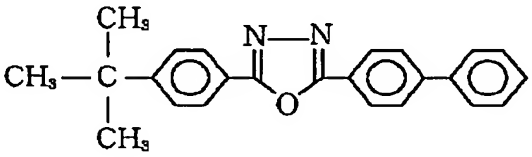
M : Zn, Mg, Be

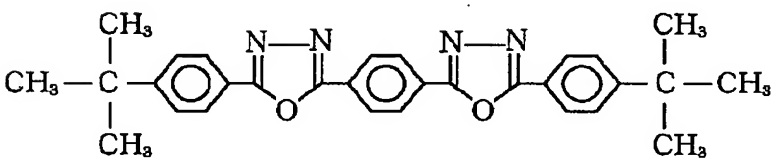


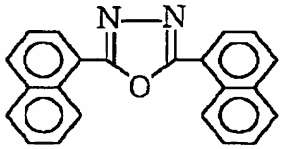
M : Zn, Mg, Be

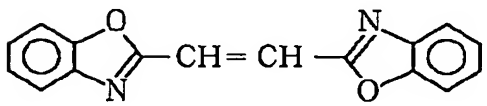
[0055]
[Formula 7]

電子輸送性化合物



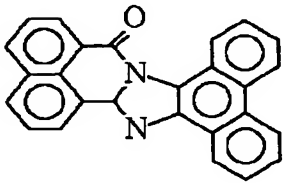


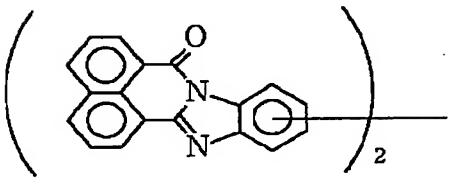


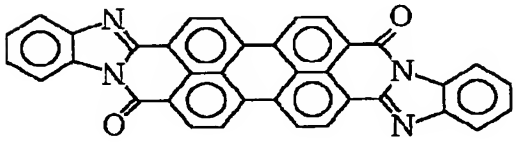


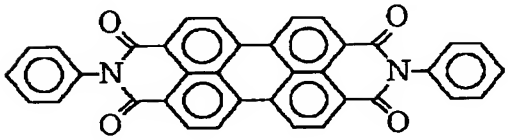
[0056]
[Formula 8]

電子輸送性化合物



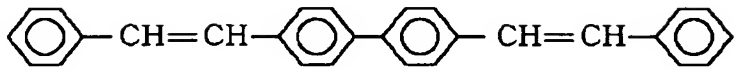


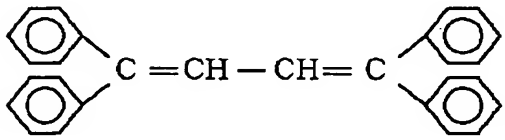


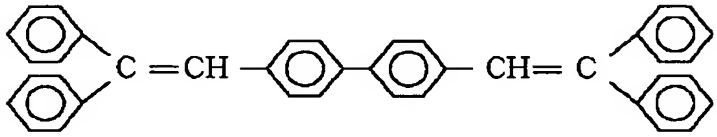


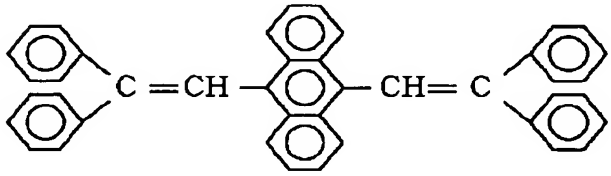
[0057]
[Formula 9]

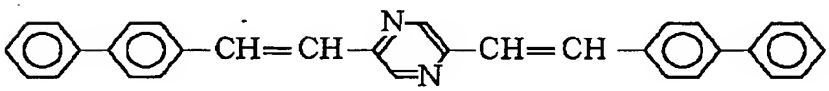
電子輸送性化合物

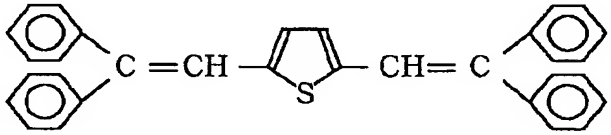








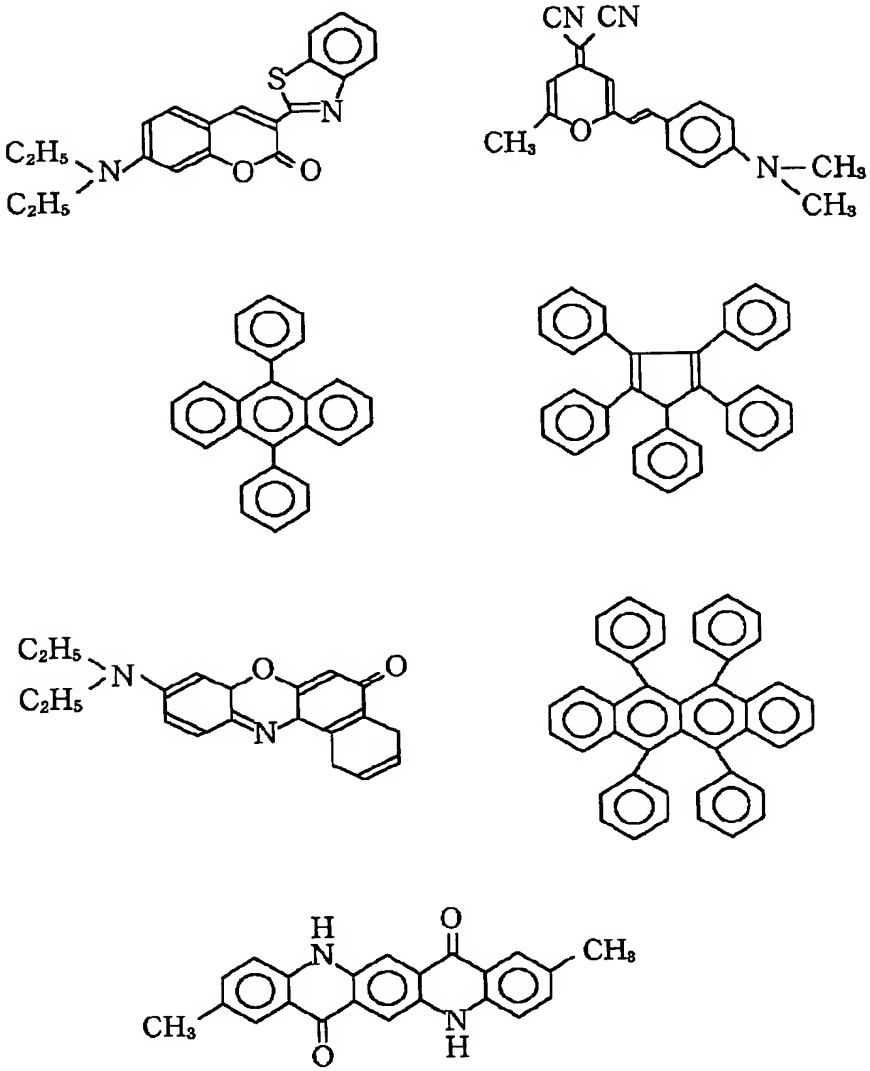




[0058] Moreover, DOPANDO coloring matter as shown below can also be doped to the electronic transporting bed 13 or the electron hole transporting bed 14.

[0059]
[Formula 10]

ドーパンド色素



[0060] Moreover, it is desirable to prepare a dielectric layer between the anode plate layer 102 and a substrate. A dielectric layer can make the reflective permeability of specific wavelength high (low) by the laminating of a layer where refractive indexes, such as SiO2 and SiO, differ. Or it is also possible to only use a half mirror.

[0061] (2nd operation gestalt) The sectional view of the display of the display of the active-matrix mold which is the 2nd operation gestalt of this invention is shown in drawing 2 .

[0062] 16 is a LOCOS oxide film with a thickness of 1 micrometer, and 32 is TFT for driving the pixel electrode 15 which is an anode plate formed on it. TFT32 is P-channel MOS FET to which a channel field with 1 micrometer [of channel length] and a channel width of 5 micrometers changes from polish recon. X-Y addressing of the pixel electrode 15 and TFT32 is carried out so that it may mention later, and they form 640 width and the active-matrix array of 480 length.

[0063] The drain of TFT32 is in contact with the wiring 40 of aluminum, and wiring 40 is connected to 1500A in thickness, and the pixel electrode 15 which consists of ITO of a magnitude the angle of 10 micrometers.

[0064] Similarly on the pixel electrode 15, the electron hole transporting bed 14 with a thickness of

500A, and the 500A electronic transporting bed 13 and the aluminum common electrode 12 which is cathode with a thickness of 1500A are formed. The common electrode 12 is formed over the whole pixel array of H640xV480.
[0065] The representative circuit schematic of the pixel part of this operation gestalt is shown in drawing 4 .
[0066] EL element 111 is formed between the pixel electrode 15 and the common electrode 12. Addressing of EL element 111 is carried out by the level signal line 113 and the vertical-scanning line 112.
[0067] The vertical-scanning line 112 is connected on the gate of the transistor 114 for access which consists of TFT, and the level signal line 113 is connected to the drain. If the seal of approval of the signal for actuation created from the video signal is carried out to the level signal line 113 and a pixel is accessed by the vertical-scanning line 112, the transistor 114 for access will be turned on and will output the image information on the level signal line 113 to one [the gate of the transistor 115 for pixel actuation which is TFT32, and] terminal of retention volume 116. The other-end child of retention volume 116 is connected to the fixed electrical potential difference VCOM.
[0068] The image information electrical potential difference by which the seal of approval was carried out to the gate is held as it is, even if the transistor 114 for access turns off. The transistor 115 for pixel actuation is connected to the pixel electrode 15 whose drain side is one terminal of EL element 111 at supply voltage +V forward in source side 117, and the current according to an image information electrical potential difference is supplied at EL element 111. Here, the common electrode 12 is connected to the GND potential 118.
[0069] According to this operation gestalt, a good image with S/N higher than the 1st operation gestalt of a passive matrix can be displayed. Moreover, since it has retention volume 116, even if it is the short access time, light can be emitted in EL element 111 for a long time, and a duty ratio improves.
[0070] Moreover, according to this operation gestalt, since it is accumulable on a silicon chip, the system of EL display can be dramatically simplified for most which drive a pixel, such as both shift registers and a digital disposal circuit. Therefore, a display can be offered still more cheaply.
[0071] The configuration that an EL element continues shining according to the signal which did not restrict to this, for example, formed a nonlinear one terminal pair network component and are recording capacitors, such as diode or an MIM component, in each pixel, wrote the signal in the are recording capacitor at the time of pixel selection, and was written in at the time of un-choosing etc. is sufficient as each active-matrix circuit used for this invention.
[0072] Moreover, an amorphous silicon is sufficient as the ingredient which constitutes TFT32. Moreover, N type is sufficient as a conductivity type, and JFET, BJT, etc. are sufficient as the class of device.
[0073] (3rd operation gestalt) The outline sectional view of a display which is the 3rd operation gestalt of this invention is shown in drawing 5 . In addition, the configuration of a silicon chip 21 is the same as that of the 1st operation gestalt.
[0074] EL layer is the silicon chip formed in the front face, cover glass 33 with a light filter (henceforth, CF) 34 doubles 21 with the rear-face side of a silicon chip 21, and it is stuck in the precision of **1 micrometer.
[0075] CF34 on cover glass 33 is well-known pigment-content powder type it, and is the usual thing used for a liquid crystal display etc. Alignment of CF34 is carried out to the pixel on the membrane formed in the display of a silicon chip 21 in the precision of **1 micrometer as mentioned above. There is a method of detecting the coloring light after the approach of putting an alignment mark into the rear face of a silicon chip 21 and the front face of cover glass 33, and carrying out alignment by the well-known aligner and the white light which emits light from a display penetrate CF34, and performing alignment among the approaches of alignment.
[0076] Although the former is simple, since the pixel is formed in the front-face side of a silicon chip 21, alignment of the alignment mark by the side of the rear face of a silicon chip 21 needs to be beforehand

carried out to the pixel in the precision of **1 micrometer or less. Although it becomes expensive, complexity and since the positive doubling effectiveness is acquired, detection and alignment equipment of the latter are useful.

[0077] (4th operation gestalt) The sectional view of the cover glass with a light filter used for the display which is the 4th operation gestalt of this invention at drawing 6 is shown.

[0078] The light filter 34 and the fluorescent substance layer 36 are formed on cover glass 33. The fluorescent substance layer 36 creates the white light by well-known work from a blue light with short wavelength.

[0079] It is not at EL display which emits light in the white light as showed cover glass 33 to the 3rd operation gestalt, and the same system becomes realizable by applying blue glow to it which emits light.

[0080] According to this operation gestalt, still more nearly usable EL ingredient to an EL element increases.

[0081] (5th operation gestalt) The example which forms a blue white conversion fluorescent substance layer on a direct membrane is also considered as the 5th operation gestalt of this invention again.

[0082] A fluorescent substance layer does not need precise alignment that what is necessary is just to form in the whole surface unlike CF. The well-known applying method, vacuum deposition, and print processes can be used for formation of a fluorescent substance layer.

[0083] (6th operation gestalt) The outline sectional view of the display which is the 6th operation gestalt of this invention is shown in drawing 7 . In addition, the configuration of a silicon chip 21 is the same as that of the 1st operation gestalt.

[0084] Although anisotropic etching is performed in order to carry out the rarefaction of the silicon chip 21 of a display 25 as above-mentioned, a silicon chip 21 serves as only a membrane which has the thickness of several micrometers after that. So, the relation of the substrate 22 for drawers which carries out support reinforcement of a membrane and it becomes important.

[0085] In this operation gestalt, electric conduction adhesion of the common electrode 12 is carried out with the substrate 22 for drawers with the silver paste which is the conductive binder 86 which a foxtail millet cannot produce easily. When a big foxtail millet 10 micrometers or more occurs in adhesion, it is because [which is added in the case of anisotropic etching] breakage may arise in a membrane for thermal and mechanical stress.

[0086] (7th operation gestalt) The outline sectional view of the display which is the 7th operation gestalt of this invention is shown in drawing 8 . In addition, the configuration of a silicon chip 21 is the same as that of the 1st operation gestalt.

[0087] 38 is a conductive liquid which consists of mercury, and has realized ohmic contact of the common electrode 12 and the drawer electrode 23 on the substrate 22 for drawers. Spreading formation is carried out on the electronic transporting bed 13 which is an overcoat layer which consists of polyimide resin with a thickness of 1 micrometer, and are the common electrode 12 and an EL layer, and the electron hole transporting bed 14, and 39 has prevented the electric short circuit of a between [EL layers] which is not meant. Moreover, the mercury which is a conductive liquid 38 has the work which eases the various stress produced in the case of anisotropic etching like the 6th operation gestalt.

[0088] Moreover, it is also possible to use organic [which contains the polyethylene glycol which is an organic substance with high viscosity, the conductive liquid crystal matter, and the conductive matter instead of the mercury which is a liquid nature metal], and inorganic various liquids. However, such conductivity needs to satisfy predetermined ohmic contact resistance.

[0089] Moreover, other well-known ingredients, such as for example, high mull resin, are sufficient as the construction material of the overcoat layer 39.

[0090] (8th operation gestalt) The outline sectional view of the display which is the 8th operation gestalt of this invention is shown in drawing 9 .

[0091] 11 is the fundus of the SiMOX (separation by implanted oxygen) substrate manufactured using the CZP (100) silicon substrate with a thickness of 625 micrometers, and the embedded oxide film 40

with a thickness of 1500A and the P type epitaxial layer 41 with a thickness of 0.3 micrometers are formed in the front-face side.
[0092] Into the epitaxial layer 41, N-channel MOS FET which constitutes the transistor 42 for actuation which consists of N-channel MOS FET which drives a pixel, and the circumference circuit 19 is formed of the same manufacture process.
[0093] since a high speed and a highly efficient single crystal Si transistor can be used as a transistor for pixel actuation according to this operation gestalt -- further -- the multi-pixel high -- a gradation display is realizable. Moreover, since the process which manufactures a transistor is the same as that of MOSFET which constitutes the circumference circuit 19 unlike it of TFT of the 2nd operation gestalt, its process is cheap. Moreover, a SiMOX substrate is not so expensive as an SOS substrate by implementation of a cheap oxygen impregnation machine. Therefore, the silicon chip 21 for EL burning can be offered still more cheaply.
[0094] Moreover, if there is no opaque SOI substrate used for this invention and it is a substrate [that it is cheap and ecology], it is good anything. [of restricting nothing to a SiMOX substrate]
[0095] (9th operation gestalt) The outline sectional view of the display which is the 9th operation gestalt of this invention is shown in drawing 10 . In addition, the configuration of a silicon chip 21 is the same as that of the 1st operation gestalt.
[0096] 21 is the silicon chip of a magnitude the angle of 25mm with which 1000x1000 active-matrix EL pixels were formed. 15 is 1500A in thickness it is thin from an ITO electrode, and a pixel electrode which is an anode plate of a magnitude the angle of 10 micrometers, and 12 is cathode which consists of aluminum alloy with a thickness of 1500A. Ohmic contact of the cathode 12 is carried out to aluminum drawer electrode 23 with a thickness of 1500A formed on the substrate 22 for drawers. Although the lamination of the substrate 22 for drawers and a chip 21 uses a sealant 24, a silicon chip 21 and the flow of the substrate 22 for drawers are secured by applying the silver paste 43 and sticking it on the pad 44 for a vertical flow formed on the silicon chip 21 at spreading and coincidence of a sealant 24.
[0097] In this operation gestalt, since the external circuit linked to the substrate 22 for drawers becomes unnecessary, the system of EL display is simplified more.
[0098] (10th operation gestalt) You may apply to EL display of a passive matrix by establishing many contacts of the silver paste 43 as the 10th operation gestalt of this invention again.
[0099]
[Effect of the Invention] As explained above, according to this invention, cheap EL display with many detailed pixels can be obtained. Moreover, by combining this EL indicating equipment with amplification optical system, products, such as a high definition, big screen HMD, and a projector, can be obtained.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the outline sectional view showing the 1st operation gestalt of the display of this invention.
[Drawing 2] It is the representative circuit schematic of the 1st operation gestalt.
[Drawing 3] It is the sectional view of the display of the 2nd operation gestalt of the display of this invention.
[Drawing 4] It is the representative circuit schematic of the pixel part of the 2nd operation gestalt.
[Drawing 5] It is the outline sectional view showing the 3rd operation gestalt of the display of this invention.
[Drawing 6] It is the sectional view of the cover glass with a light filter used for the 4th operation gestalt of the display of this invention.
[Drawing 7] It is the outline sectional view showing the 6th operation gestalt of the display of this invention.
[Drawing 8] It is the outline sectional view showing the 7th operation gestalt of the display of this invention.
[Drawing 9] It is the outline sectional view showing the 8th operation gestalt of the display of this invention.
[Drawing 10] It is the outline sectional view showing the 9th operation gestalt of the display of this invention.
[Drawing 11] It is drawing showing the conventional EL element.
[Drawing 12] It is drawing showing the conventional EL element.
[Drawing 13] It is the outline sectional view showing the conventional LCD.
[Description of Notations]
11 Silicon Substrate
12 Cathode (Common Electrode)
13 Electronic Transporting Bed
14 Electron Hole Transporting Bed
15 Anode Plate (Pixel Electrode)
16 LOCOS Film
17 Interlayer Insulation Film
18 Passivation Film
19 Circumference Circuit
20 Bonding Pad
21 Silicon Chip
22 Substrate for Drawers
23 Drawer Electrode
24 Sealant
25 Display
31 Wiring
32 TFT
33 Cover Glass
34 Light Filter
35 Binder
36 Fluorescent Substance Layer
37 Conductive Binder
38 Conductive Liquid
39 Overcoat Layer
40 Embedded Oxide Film
41 Epitaxial Layer

42 Transistor for Actuation
43 Silver Paste
44 Pad for Vertical Flow
101 EL Element
102 Vertical Line
103 Horizontal Line
104 Vertical Shift Register
105 Level Shift Register
106 Digital Disposal Circuit
107 Video Signal
111 EL Element
112 Vertical-Scanning Line
113 Level Signal Line
114 Transistor for Access
115 Transistor for Pixel Actuation
116 Retention Volume
117 Source Side
118 GND Potential
201 Single Crystal Si Substrate
211 Transparence Substrate
202 212 Cathode
203 213 Electronic transporting bed
204 214 Electron hole transporting bed
205 215 Anode plate
231 Silicon Substrate
233 Liquid Crystal
235 Pixel Electrode
236 LOCOS Film
237 Interlayer Insulation Film
238 Passivation Film
239 Circumference Circuit
240 Bonding Pad
241 Silicon Chip
242 Substrate for Drawers
243 Drawer Electrode
244 Sealant
245 Display

[Translation done.]